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The Study of Principles as a Help to Horticultural Practice.

TWO bulletins on the care of fruit-trees, just issued by the Cornell Experiment Station, are not only directly instructive upon the subject of which they treat, but they furnish good examples of two methods of investigation. One of these, Bulletin No. 103, has been prepared by Professor Roberts, and it is a record of some very careful experiments undertaken to answer the question whether the comparative failure of the orchards in western New York is not largely due to the exhaustion of the soil. By careful weighing and analyzing of wood, fruit and leaves it was determined with some accuracy that the value of the principal plant-foods—that is, the value of the nitrogen, phosphoric acid and potash—which would be taken from an acre of productive orchard in twenty years would amount to some $400, while the total value of the same plant-foods that would be taken up by the grain and straw of crops of wheat grown on an acre of land for twenty years in succession would not amount to one-third as much. No one would think of raising wheat for twenty years consecutively on the same land, and the wonder is not so much that old orchards fail, but rather that they did not cease to produce merchantable fruit years ago. This experiment, therefore, establishes the fact that there is sufficient robbery of the soil to account for the lessening yields of fruit, but, of course, it does not follow that the simple return of this amount of plant-food to the soil would necessarily give full crops. No doubt, there are other disturbing causes, and we must know, at least, when, where and in what manner the food must be given and what trees to select and how to treat them so that they may use this food to the best advantage.

Bulletin No. 102, by Professor Bailey, on the contrary, does not contain a single experimental fact. A mass of data has been gathered from wide and long observations of orchards under many conditions, and then it has been attempted to deduce certain principles from them. This is not the usual method of the stations, but, certainly, when such inquiries are conducted in a judicial spirit, they admirably supplement special investigations. The investigation of the behavior of a single tree very properly accompanies the generalization from many hundred orchards, and it is important to observe that the two inquirers arrive independently at the same essential conclusion, which is, that orchards need more thorough tilling and fertilizing than they receive.

What we should like to emphasize here is that the primary need of cultivators of the soil is principles rather than information. Broadly, it is education that is needed rather than specific knowledge. People who demand what they call practical instruction really want information for a particular case; that is, they want rules for some local and inflexible conditions, but really this is what no one can give. The experiment station cannot tell the farmer exactly what must be done with his particular farm. The best that can be done is to furnish him with principles which he must apply for himself. He knows his own soil as no one else does, he knows his own resources and limitations, and he ought to be able to make use of general principles as they apply to his own particular case better than any one else. Professor Bailey's bulletin shows him that there may be many causes why his apple crops fail, but he must ultimately decide for himself what is the fundamental trouble. He may not do this to-morrow, or even next year, but if he familiarizes himself with general laws and studies his land and his crops he will in the end master the problem. If the experiment station were to take charge of his farm and conduct it for him he would in the end be the loser, because he would learn nothing except to rely upon others rather than upon himself, which is a lesson above all others to avoid.

It is not our purpose to speak of the contents of these bulletins only so far as to explain the different methods upon which they have been prepared, but it may be well to state that one of the reasons assigned by Professor Bailey for the probable failure of many trees to bear paying crops is that they have been propagated from unproductive individuals. This is something which is rarely taken into account, and yet we all know that no gardener would take a cutting from a Rose-bush which bears no flowers. Why, then, should we take a cion from a tree which is unproductive as individuals often are, or from one which is not desirable in habit, or which lacks vigor. It is hazardous to enunciate general laws, but it would certainly seem worth while to select grafts from trees of individual merit, which have been known as productive for a period of years. Time would show whether anything is to be gained by this practice, but unless all analogies fail it ought to prove a profitable experiment.

AN article in another column of this issue, on the danger which threatens the agriculture and horticulture of the country from certain foreign insects, invites attention once more to a subject we have often discussed. The constitutional difficulties in the way of preventing the contagious diseases of animals and plants, as well as destructive insects from spreading from state to state, are serious ones, but the subject here touched upon is not connected with interstate commerce, but with importations from foreign countries. It is, no doubt, as much within the power of the Federal Government to make quarantine laws against scale insects as it is to protect men and domestic animals from the germs of disease. The losses which this country suffers through insects are estimated by hundreds of millions of dollars every year, and it is well known that many of the most dangerous of these pests of our orchards and gardens have come from foreign countries. California has a quarantine officer who is apparently rendering the state a genuine service, and if the abounding scale insects of the tropics are to be prevented from invading our southern coasts some similar action must be taken on our Atlantic seaboard. We need to know more of these insects and of their habits, so that we can detect them before they gain a foot-hold here. We know that a dangerous scale insect from California has been found in abundance on the fruit-stands of our eastern states.

Equally destructive pests may effect a landing in some of our seaports on the fruits and vegetables which we receive from the West Indies and from South America, as well as upon the decorative or other plants imported. We have an association of economic entomologists, and this body ought to be able to frame a bill to establish a quarantine, not only against injurious insects, but against the contagious diseases of plants. There is also an organization made up of the officers of the experiment stations and the professors of the agricultural colleges, whose natural duty would seem to be a general oversight of the interest of agriculture and horticulture. The subject in question ought to be worth careful study by a body which represents the entire nation, and we see no good reason why a national quarantine bill should not be framed and introduced before the close of the present session of Congress.

Thomas Andrew Knight.

WE have already published one or two of the five-minute talks with which Professor Bailey, of Cornell University, prefaces his lectures on Evolution. One of his students again sends the following from her notes as worthy of permanent record:

Thomas Andrew Knight, one of the first and greatest of our botanical philosophers, was the forerunner of Darwin, who may be considered the second of our great horticultural philosophers. Knight was born in 1759 and died in 1838. He was educated at Oxford, and he lived at Elton and Downton Castle, England. He devoted his whole life to agriculture, but he also conducted experiments upon the crossing of plants, made various studies on the physiology of plants and the like. Nearly all of his writings have been productive of great good in after years. The first essay which he ever prepared is one upon the decay of fruit-trees and the causes therefor. This was written in 1795. As a means of averting the decay of the trees, he advised raising new varieties by crossing. He was the first man, so far as I know, who advised the use of cross-fertilization for the purpose of producing new varieties, and for the purpose of improving existing ones. A similar work was taken up by Darwin and made him famous. The teachings of Lord Bacon were leading sources of information when Knight began to write. Bacon was convinced that crossing in animals and plants is capable of yielding great results, but he was ignorant of the exact process. His opinions, which were current when Knight began his work, were as follows: "The compounding and mixture of plants is not found out, which, nevertheless, if it be possible, is more at command than that of living creatures; wherefore it were one of the most noble experiments touching plants to find this art; for so you may have a great variety of new plants and flowers yet unknown. Grafting doth it not: that mendeth the fruit, or doubleth the flower, but it hath not the power to make a new kind—for the scion ever overruleth the stock."

Knight was first brought to notice by Sir Joseph Banks, who was interested in agriculture, and whose name has come down to us as one of the leading scientists and naturalists of his time. Sir Joseph was interested in the Royal Agricultural Society, the members of which had drawn up a set of queries to which they desired answers from various districts, and Banks hit upon Knight as being the person to whom these queries should be addressed. Banks soon found that Knight "was not only eminently qualified to effect the immediate object in view, but that he had made observations, and deduced theories from them, calculated to throw much light on the more abstruse subject of vegetable physiology."

Knight was the first to make experiments to determine why roots go down and stems go up. In 1803 he made the acquaintance of Sir Humphrey Davy, who afterward became a very warm friend, and with whom a correspondence began which was of great benefit to both persons and continued until the death of the latter in 1829. The Horticultural Society of London was established in 1804. The first active president was Thomas Andrew Knight, who was elected in 1811 and served until the time of his death in 1838. The golden age of the society was covered by the period of his administration.

Knight was the first man to propose the theory that the variation of plants is due to excess of food-supply. He also produced a great number of new varieties of plants by cross-fertilization, and among Cherries we have the Elton at the present time, the Downton and others.

Payne Knight was an older brother of Thomas Andrew and became a famous Greek scholar and poet.

California Fruits.

A PAPER read by D. M. Rowley, editor of *The California Fruit Grower*, before the State Fruit Growers' Convention at Sacramento, gave some statistical compilations which are not quite as dry as figures usually are. In reviewing the trade in fresh deciduous fruits he noted that the earliest shipment eastward in the season of 1895 was two car-loads of cherries, sent on the 8th of May, although shipments of the same fruit had been made by express as early as the 17th of April, and auction sales of California cherries began in Chicago on the 13th of May. From the 8th of May to the end of October 4,435 car-loads were shipped altogether. Of these, 1,473 car-loads went to Chicago, 928 to New York, 279 to Boston, 176 to Omaha, 148 to Denver, 124 to Minneapolis, 109 to St. Paul and 42 to London, England. Twenty other cities are named as receiving less than a hundred car-loads during the year, but since there are about one hundred cities in this country which contain more than 40,000 inhabitants, and more than two hundred cities with a population of 30,000, it is not surprising that nearly 700 car-loads were sold in cities and towns not designated—that is, at points unknown to any one but the shipper.

The freight rate of a car carrying 24,000 pounds to Chicago from California is $300, and this is regarded by railroad men as reasonable when the distance and character of the service is considered. Refrigeration charges are extra, $90, for example, from Sacramento to Chicago, making a total of $390 a car to that city. From this it appears that the freight and refrigeration on the 1,400 cars sent to Chicago would amount to more than half a million dollars. The freight rate to New York is $360 and the refrigerating charges $130, a total of $490 a car, so that transportation charges on California fruit to New York amounted to more than $450,000 during the year. Taking the average charges paid for freight and refrigeration for shipments to Chicago and New York it appears that the vast sum of $1,931,480 was paid for the transportation of fresh fruits from terminals in California to eastern cities, and this does not account for the local freights paid by shippers before they reach the main line of the Southern Pacific Railroad Company. Of course, the commissions, cartage and other expenses connected with the shipping business at the eastern end of the line would greatly swell this amount. It ought to be added that shipments from California last year were smaller than they have been since the year 1891. In 1894 the grand total was 179,576,500 pounds.

Among varieties of fruits, peaches took the lead in quantity, amounting to 1,288 car-loads for the year; of pears there have been 1,167 car-loads, of grapes 910 car-loads, of plums 390 car-loads, of cherries 177 car-loads, of apricots 167 car-loads, of apples, so far, but 95 car-loads, of prunes 75 car-loads, of quinces 13 car-loads, and of nectarines 4 car-loads. The climate of California not only enables one to work out-of-doors all the year round and makes long seasons for fruit-growing, but it is also a good place for curing fruit, as the enormous increase in the amount of cured fruit bears witness. Exclusive of raisins and dried grapes, California has averaged during the last five years an annual production of more than eighty million pounds of dried fruit—that is, nearly 1¼ pounds of this product to every man, woman and child in the United States. Altogether, in the five years from 1890 to 1894 inclusive, counting the fresh deciduous fruits, citrus fruits, dried fruits, canned fruits and raisins, the enormous total of 2,308,298,400 pounds has been produced. The unestimated quantities of fresh and dried fruits produced east of the Rocky Mountains are, of course, additional to the California output, as also the hundreds of cargoes of bananas, oranges, lemons, pineapples, raisins, prunes, currants, figs, etc., received from foreign countries, and the enormous amount of fruit consumed in the United States can hardly be realized.

Scale Insects Liable to be Introduced into the United States.

ABOUT 140 species of scale insects are now known from the United States, of which, however, at least thirty-five have certainly been introduced through human agency. The following are noticeably injurious:

(1) Probably or certainly introduced. Icerya purchasi, Gossyparia ulmi, Dactylopius adonidum, D. citri, Orthezia insignis, Asterolecanium quercicola, Pollinia pollini, Lecanium persicæ, L. juglandis, L. hemisphæricum, L. oleæ, Aspidiotus nerii, A. ficus, A. aurantii, Mytilaspis citricola, M. gloverii, M. pomorum, Aspidiotus perniciosus, Chionaspis citri, C. biclavis, Aulacaspis rosæ, Diaspis amygdali, Phenacoccus aceris, Lecanium hesperidum, Parlatoria pergandii.

(2) Probably or certainly native. Pulvinaria innumerabilis, Lecanium pruinosum, L. ribis, L. tulipiferæ, L. fitchii, Aspidiotus uvæ, A. ancylus, A. juglans-regiæ, Chionaspis furfurus, C. ortholobis, Aspidiotus rapax. The second and the last have, perhaps, been introduced.

Thus it is seen that most of the injurious species have been introduced into the country; in fact, all of those which are of first importance, if we, perhaps, except Chionaspis furfurus and Pulvinaria innumerabilis. It is just possible that Aspidiotus perniciosus is native. Just lately, Asterolecanium pustulans has turned up in Florida, and Dactylopius virgatus in Texas. These species are not yet complained of in the United States, but both are very injurious in certain tropical localities, such as Jamaica.

In the great majority of cases it is not known exactly how or when the introduced species reached this country, but it may be broadly stated that they all came on plants. Positive evidence is, however, afforded by Mr. Alexander Craw, the energetic horticultural quarantine officer of California. He boards the steamers that arrive at San Francisco, and inspects all plants and trees about to be landed. Quite frequently he finds them infested with scale insects, and in all such cases has them destroyed, being empowered by the law of the state to do so. The labors of Mr. Craw have probably not been appreciated at their true value; in fact, it is impossible that they should have been, because the most remarkable results he has achieved have not yet been published. Unfortunately, we possess no detailed or accurate information regarding his earlier finds, but recently he has been sending me the species detected, and without naming them here I may say there were seven on plants from Japan, three from Honolulu, two each on plants from Mexico and Central America, and one each on plants from Tahiti, the Marquesas Islands and Australia.

Not a single one of these scale insects is native to this country, and only one, Aspidiotus aurantii, is established in California. Some of them, Diaspis amygdali, for example, are known to be very injurious. Yet these results have all been obtained quite recently; in fact, every month seems to make remarkable additions to the list. Let the California people consider what it would have been worth to them to have kept Icerya and the San José scale out of the country; let them now consider, in view of recent experiences in the east, what it would be worth to keep Diaspis amygdali (lanatus) out. The damage done by either of these species in a few years would exceed the salary of a dozen quarantine officers.

It is hardly sufficient to say that California is pursuing a wise policy in this matter; to do otherwise, with the interests she has at stake, would be sheer imbecility. In view of all this, it seems amazing that nothing in the same way is being done in the east or south. I do not propose at the present time to discuss the question of quarantine along the Atlantic seaboard, but rather to call attention to the condition of affairs in the south. From California to Florida there is no serious attempt made of any kind to prevent the introduction of pernicious insects.

From the regions south of the United States (Central and South America and the West Indies) are known at present about 130 species—that is, not quite so many as from the United States. But there can be no doubt that the tropics of America are very rich in scale insects, and the reason why no more are recorded there is simply that, except in the West Indies, very little collecting has been done.

To illustrate the abundance of scale insects in the tropics I may say that I found in the small garden attached to Dr. Strachan's house, in Kingston, Jamaica, July 27th, 1892, sixteen species and varieties, seven of which have never been found in the United States. It is true that one of them, the species Parlatoria pergandei, occurs in our country, but the variety Crotonis, which I found, has an entirely different food-plant, and from an economic point of view is quite a different thing. Perhaps the most pernicious species among the sixteen not found in the United States is Aspidiotus articulatus, which attacks Citrus-trees as the red scale does in California.

To give anything like a list of the scale insects in the West Indies which are liable to be imported into this country would occupy too much space. But there are specially dangerous ones infesting Citrus-trees, Sugar Cane, Sweet Potato, Yam, Cotton, Palm, Hibiscus, Acalypha and other plants which are articles of common transportation.

As regards Mexico and Central America our knowledge is singularly deficient, and would be fragmentary, indeed, had not Professor C. H. T. Townsend lately been collecting in Mexico for the Department of Agriculture. The results of his mission will be set forth in a bulletin shortly to be published; but it may be permissible to state now that he found, in particular, several injurious scale insects upon the Citrus-trees. One of these, Aspidiotus scutiformis, has never yet been detected in the United States. Thus we are threatened all along our southern border, and the process of introducing injurious species, which has gone on so far almost unheeded, is likely to lead to consequences more serious than are often contemplated. It is true that the climatic differences, from south to north, afford a certain amount of protection, but the way in which the Diaspis amygdali (lanatus), of the West Indies, has established itself in the city of Washington should convince any one that immunity from differences in climate cannot be relied upon. Nobody supposes that many West Indian species could establish themselves far north in the United States, but many are already common to the tropics and the southern states, while trouble may even be caused in the north in hot-houses, as with the mealy bugs and Orthezia insignis. It is not necessary to postulate that the Coccids should destroy whole crops, in order to make out a case for preventive measures. The profit usually represents but a small part of the value of the crop, and the insect has but to eat that up to ruin the business. Thus any loss will be felt, unless, perhaps, in times of so-called overproduction.

It is useless to cry out after the harm is done; now is the time; in a few years it will be too late, as indeed it is already too late to stop many species. The indications from the facts at hand are plain. In the first place, strenuous efforts should be made to ascertain more accurately the Coccid fauna of the whole neotropical region, and especially of those parts near our own borders. In the second, quarantine should be set up, as in California, at those places through which plants are brought into the United States. These are not numerous, and probably it could be made unprofitable for importers to bring their plants through ports not quarantined; that is to say, if the trade would recognize that no plants could be safely received unless certified as clean by the appointed quarantine officer, non-inspected plants would lose some of their value, even if salable.

Las Cruces, N. M. *T. D. A. Cockerell.*

The element of interest which, beyond question, should be placed first, if possible, in the park of any great city is that of an antithesis to its bustling, paved, rectangular, walled-in streets—a requirement best met by a large meadowy ground of an open, free, tranquil character.—*Olmsted & Vaux.*

New or Little-known Plants.

Stapelia gigantea.

THE illustration on p. 515 is reproduced from a photograph of the plant of Stapelia gigantea, which was briefly referred to recently in Garden and Forest (p. 454), which flowered a few weeks ago in the Royal Gardens, Kew. The flowers are a foot in diameter, leather-like in texture, the surface wrinkled and the color pale yellow, with red-brown transverse lines and covered with very fine silky purplish hairs. Each flower lasts two or three days, and on first opening emits a disagreeable odor. It is more than thirty years since this species was introduced into English gardens from Zululand, but it did not flower till 1888, when a plant in the collection of Sir George Macleay, Pendell Court, Surrey, produced flowers in November, and from these the colored plate in *The Botanical Magazine* was prepared. Sir Joseph Hooker there speaks of it as follows: "This, some Rafflesias and certain species of Aristolochia are the largest-flowered members of the vegetable kingdom, and, what is curious, all are most fetid and have lurid colors. They agree in no other characters; they differ altogether in botanical affinity; and they inhabit widely distant parts of the world, namely, south Africa, Malaya and Brazil." To this category may be added the great Amorphophallus Titanum, which has the largest of all floral structures, with lurid colors and a penetrating disagreeable odor.

The claims of Stapelias generally to the notice of horticulturists were urged in an article published in Garden and Forest in 1890, page 179, where also will be found directions for their cultivation, based upon experience at Kew and in a few other gardens where these plants find favor. The requirements of S. gigantea are somewhat exceptional. It thrives only when grown in a hot moist stove from April till September, when the growth matures and the flower-buds show. It should then be hung up or placed upon a shelf near the roof-glass in a sunny dry position in the stove. It grows very freely under this treatment, the plant represented in the picture being only eighteen months old from a cutting. The prostrate stems branch freely and produce roots from every node.

Many of the species of Stapelia are small in flower and altogether wanting in characters that would recommend them for the garden; there are, however, some which have large and attractive flowers, and are to be obtained from a few nurserymen. They are S. Bufonis, of which picta and variegata are forms; S. deflexa, S. grandiflora, S. Desmetiana, S. hirsuta, S. Plantii, S. sororia and, of course, S. gigantea. The first-named is the best known of all, and is the common Carrion-flower. It can be grown in a cold greenhouse or even in a room window where direct sunlight can reach it. S. grandiflora has flowers five inches in diameter and is covered with long purple hairs; S. Plantii is another large-flowered species remarkable for its stout, erect, dark green stems and zebra-marked purple and yellow hairy flowers. These are all easy to manage and flower every year. I may as well mention here that Stapelias are not Cacti, but Asclepiads, although it is usual for nurserymen to class them with Cacti, and I have even seen them thus classed in books. They are all African.

London. *W. W.*

Plant Notes.

Phyllotænium Lindeni.—This is one of the most beautiful foliage-plants of the Calla family. The leaves sometimes grow to a height of four or five feet, with a blade two feet in length. The plant forms immense masses of foliage if it is not divided too often, and while a rather moist and warm atmospheric condition is best for its development, it can stand drought and a certain degree of cold for a considerable time with immunity. As a plant for the house it is unequaled, and requires comparatively little attention. The leaves are hastate in outline, borne on erect, rather fleshy, leaf-stalks; the blade is green, marked along the middle and principal veins with broad bands of white. The effect is rich and luxurious. Rich loamy soil, with good drainage, and a temperature of about sixty-five degrees are the best conditions for success, and if it is kept moderately warm, moderately moist and absolutely clean this handsome Aroid cannot fail to give satisfaction.

Aphelandra orientalis punctata.—This is a handsome stove shrub with lanceolate opposite leaves of a bright green color, variegated and spotted along the midrib with a broad irregular band of silvery white and more or less sprinkled over with silvery dots. The habit is rather slender, but by means of pinching the young shoots quite nice and bushy plants may be had. Like most tropical plants of its family (Acanthaceæ), it is an exceedingly fine subject for table decoration if properly treated. Cuttings root in about two weeks, but require a brisk bottom-heat. A rich vegetable soil composed of one part loam, one leaf-mold, one well decayed horse-manure and one part sand is the best soil that can be obtained for this and similar plants. Any one interested in fine foliage-plants for a stove or warm greenhouse will find this a very rare and pleasing subject.

Dichorisandra undata.—Among the smaller foliage-plants suitable for small conservatories and greenhouses, this beautiful species takes a prominent place. It is nearly related to Tradescantia, and is not unlike some of the large-leaved forms of that genus. The leaves are subcordate, or nearly orbicular, with a peculiar wavy or ruffled surface; deep olive-green, with several longitudinal grayish bands, of which the middle one is broadest, about half an inch wide. The stem is thick and fleshy, and the leaves are produced close together at the top. The usual size of the plant in greenhouses is about eight inches, although it probably grows larger in its native home. To be satisfactory, the plants should be grown into broad bushy specimens, when they are very ornamental. Propagation, by means of cuttings in bottom heat. The soil should be rich and fibrous. Plenty of water is needed in summer, as well as a shady position and about seventy degrees of heat.

Cultural Department.

Pruning of Street-trees.

THE Parking Commission of Washington has been in existence for more than twenty years, and the same men who were appointed at the beginning, W. R. Smith, William Saunders and John Saul, are serving on it still. As might be expected from the work of an intelligent body, much valuable information has been accumulated, especially as regards the system of pruning adopted. It has been the custom of the Parking Commission, when planting three or four year old trees on the streets, to head them back to a height of about nine feet from the ground and shorten in all lateral branches. This has worked satisfactorily, as it tends to make the tree push out fresh growths, and at the end of the first year the trees look as if they had not felt the change.

It is in the treatment of the trees after they have attained the age of a dozen years or more that the results of the different methods of pruning are so very noticeable. For example, the Occidental Plane, if left to itself, will grow very irregularly, become sickly, and then invite attacks by scale insects, which soon threaten to kill them altogether. On several of the streets a few years ago this was exactly the condition of these trees. Heroic measures were decided upon in the way of cutting back the branches to within a short distance of the stem. This was carried out on several miles of streets, much to the horror and dismay of the property-owners, who declared that the members of the commission had suddenly turned insane. The commissioners said nothing, probably they had some doubts as to the results of the experiment. The treatment proved to be the proper one, however, and within two years from the date of pruning, the streets where the pruning was done had the most beautiful trees in the city. The Oriental Plane grows into a more symmetrical shape and does not need the knife so often to keep it in shape or to give it new vigor as does Platanus occidentalis.

North Carolina Poplars, which have been pruned severely

Fig. 71.—Stapelia gigantea at Kew Gardens—one-fourth natural size.—See page 514.

because their branches have become straggling, are refurnished very quickly after pruning with strong growths. These growths appear well for the first part of the season, but after a period of dry weather they are the first to lose their leaves, while those Poplars which have only been moderately pruned retain their foliage much longer.

The Maiden-hair-tree, Ginkgo biloba, has one marked peculiarity. Some specimens after planting stand still and absolutely refuse to grow. Most of the trees make an open growth, as may be seen on the avenue between the Department of Agriculture and Pennsylvania Avenue; these trees have never been pruned, and some of them are little more than straight

sticks, although it is something like fifteen years since they were set out. On the other hand, those trees planted on the west side of Lafayette Square and on Peirce Street are ideal specimens, owing to the fact that they have been shaped on several occasions.

The Silver Maple does not last in a healthy condition for more than sixteen years as a sidewalk-tree in Washington. As the natural soil is not of the best, when the holes are dug the soil taken out is carted away and new and better material takes its place. This keeps the tree in good health for several years, but when it gets beyond certain dimensions it, of course, begins to show signs of starvation in the losing of the lower branches and ripening great quantities of seed annually. The only way in which the life of the tree is prolonged for a few years is by cutting it severely in to the main stem. This is done in the early spring months, and before summer is over the tree is pretty well furnished with a profusion of fresh growths.

Botanic Garden, Washington, D. C. *G. W. O.*

Notes from the Harvard Botanic Garden.

THE genus Urceolina, although a small one, has three interesting species. They are bulbous plants which belong to the Amaryllis family, and are found in the Andes. For the last two or three weeks some flowering plants of U. pendula, the drooping-urn flower, have been very much admired by visitors to the garden. These plants are scarce in gardens from some cause or other, and yet they are easy to grow and flower freely here every year. The bulbs measure about three inches across, and during the growing season they have one or two leaves. These are dark green, oblong, and contracted into the petioles and measure from ten to twelve inches in length and two or three inches at the broadest part. At the apex of an erect scape, which is about a foot and a half high, the pendulous flowers are produced in umbels, those on the plants here having from six to eight flowers, and the filiform peduncles are nearly two inches long. Just above the ovary the perianth is contracted and then enlarged into an oblong, tubular, urceolate throat, and the lobes are spreading at the apex. The showy part of the flower is the enlarged part of the perianth, which is nearly two-thirds of its length, and it is of a rich golden yellow color. The spreading lobes are green and margined with white. When the plants are in bloom they are without foliage, but the pots can be placed among groups of Adiantum cuneatum, where the flowers last for several weeks and make a pleasing show above the dark green fronds of the Ferns. After the plants have flowered they may be placed in an intermediate house and in a position where they will be kept dry. Just before growth begins in spring the bulbs should be taken out of the pots and the exhausted soil carefully removed. Then they may be replaced, one bulb in a five-inch pot, using clean pots, plenty of drainage and a light, porous, rich soil, with the top of the bulb level with the soil. After they are potted the plants are placed in the stove, where they are kept dry until growth begins, when they are supplied freely with water. When the leaves have done their work and begin to turn yellow in early autumn, water should be given sparingly and finally withheld altogether. The flower-scapes begin to push up a few weeks after the leaves disappear. This plant is interesting botanically, as it is one of the parents of Urceocharis Clibrani, a hybrid, the other parent being the well-known Eucharis Amazonica.

Piqueria trinervia is a very common plant in gardens, where it is known almost universally as Stevia serrata. It is a useful plant, as it comes into flower just after the Chrysanthemums, and its light airy branches, with their white flower-heads, are very serviceable for cutting, and they last well. The plants branch freely, and the stems, which are three feet high or more, are thickly clad with opposite, oblong lanceolate, dark green leaves, which are subserrate and have three prominent nerves. The white flower-heads are produced very freely, and are disposed in loose corymbose, many-headed panicles. There is a dwarf form of this plant which makes compact dwarf bushes about eighteen inches high. This dwarf form we find most useful here, as the plants are more decorative and make more compact specimens. When the plants have finished blossoming, which happens some time after Christmas, the old ones are discarded, except one or two, which are kept for stock-plants. Cuttings are struck in March, and after they are well-rooted they are put into small pots, where they are kept until time for planting out in the garden in May. They grow fast in the garden, and the young points of the branches should be picked out regularly, as it makes the plants bushy. About the end of August they are lifted and potted again. They require careful handling in lifting, as the stems are very brittle and are apt to get broken. When cool weather sets in they are put in a cool greenhouse. This plant is figured in *The Botanical Magazine*, and has been cultivated as long ago as 1798, when it was introduced from Mexico. There is another form of this plant grown in gardens with white-edged leaves which is useful as a bedding-plant.

Botanic Garden, Harvard University. *R. Cameron.*

The Eranthemums.

THE Eranthemums are remarkable for the beauty of their foliage and will probably prove valuable as bedding plants. In Europe they are considered quite tropical in nature, as some of them undoubtedly are, and in the damp English climate or in the colder countries of northern Europe they could probably not be used out-of-doors. But here, where the conditions are so different, where plants like the Acalyphas will do well in the open border, Eranthemums may be used with equal success. Their foliage is not as large as that of the Acalyphas, or as highly colored as that of Coleus, but they belong to a more refined type of plants, noble in outline, with soft, harmonious coloring.

The principal kinds coming under consideration as bedding plants are the strong, erect-growing forms that develop quickly and are as easily increased as Coleus. Eranthemum albo-marginatum, with long lanceolate-acuminate leaves of a grayish green color, mottled and margined with milky white, grows to a height of two or three feet. The leaves are opposite, eight or ten inches long, under greenhouse treatment. E. nerium rubrum, with rounded-ovate leaves of the same color as the preceding one, slightly whiter. E. Eldorado, with almost cordate leaves and an obtuse apex, green, reticulated with bright yellow. In E. atropurpureum the leaves are of a deep maroon color, or sometimes nearly black, of the same shape as those of E. Eldorado.

The soil best adapted to Eranthemums is a rich vegetable one. A bed of any ordinary garden soil, enriched with plenty of well-decayed horse-manure and some rotten leaves, would answer the purpose very well. The Eranthemums are generally grown in warm greenhouses in partial shade. As indoor plants, singly in pots, they are very ornamental, as well as easy of culture. Soft-wooded cuttings, when inserted in a slight bottom-heat, will root in three or four days. When used as house-plants, or by florists for decorative purposes, the plants should always be kept young and bushy, with as luxuriant foliage as possible. As young plants are easily grown from cuttings old and stunted ones need not be kept.

Newark, N. J. *N. J. Rose.*

Hybrid Perpetual Roses.

AFTER the Chrysanthemum season is past there is generally space in the greenhouses for other plants that have been stored in cold frames or other convenient places, and we now place the first lots of hybrid Roses in a warmth of forty-five to fifty degrees to start them into gentle root-action. There is not much gain by putting them in early. December is a good time if flowers are wanted in March, and it seems impossible to have good hybrids too early. We plant in deep boxes in preference to pots. The plants remain in the boxes during the whole year and there is no check to them at any time. The only time when the roots are disturbed is when the boxes decay. New soil should be added and a slight top-dressing given each spring after the plants are well started. This treatment, with liberal supplies of stimulants in a liquid form, will sustain the plants in vigor.

No hybrid Rose is so satisfactory for forcing as Ulrich Brunner for crimson. The noble foliage is not equaled by that of any other Rose, and it will stand the strain of early forcing for an indefinite period. We have plants that have been grown in this way for five successive years, and they are again in the greenhouse as good as ever. Gustave Piganeau, a newer kind, has proved weak, and it rarely makes strong enough growth to warrant its early forcing. The same may be said of Susanne Marie Rodocanachi, sent out to excel the Ulrich Brunner. Thus far it has failed to equal the older sort; the color is brighter and the foliage good, but it has also a somewhat weak constitution. Marchioness of Londonderry is a promising new early forcing variety; it is as near to white in color as hybrids come, there being just a tinge of flesh-pink in the centre of the blooms. The flowers are of the largest size, on stout stems, with foliage of the same texture and deep color as Ulrich Brunner, and it is also almost thornless. It seems to be one of the most meritorious of new Roses and belongs

to a class that is all too scarce, namely, hybrids of delicate tints approaching to white. Clio is another of this class, but growers say that it also is of a delicate constitution and not desirable for early flowering, but as it is grown by the English growers it would seem not to be delicate. Another season will, perhaps, decide the matter.

Mrs. R. G. Sharman Crawford is one of the newest Roses with a good reputation for forcing. It is also distinct from all others in color, a deep rosy pink, the outer petals shaded with pale flesh and merging into white at the base. It has been one of the sensational varieties of recent years, and will prove, it is hoped, good for indoor work. Captain Hayward is another sort not so well known as it deserves, a bright carmine-crimson of superb form and sweetly scented, and will make a good forcing Rose as far as can now be judged.

To those who cannot devote an entire house to early hybrid Roses during the whole year, there is an easy way to get good flowers quite as early and of equal perfection by planting in boxes at least six inches deep and of length to suit the benches, or long enough to plant four plants lengthwise and two deep. We get two crops of flowers by this method each spring indoors, and a considerable number of flowers during the summer and fall when the boxes are set out-of-doors to make their growth. They need comparatively little water; a sprinkling overhead with the hose serves to keep them both clean and moist, and in the fall the boxes are set on their sides to keep the plants from fall rains and to help mature the wood, which is at this time of a deep mahogany color with prominent buds for next season's bloom.

South Lancaster, Mass. *E. O. Orpet.*

Propagating Chrysanthemums.—We have renewed our propagating-bed with clean gray sand, and intend in the course of a week to put in some cuttings of Chrysanthemums for specimen plants. This is about a month earlier than we have usually done this work, but, as the plants are intended for exhibition, they will need a longer season if they are to grow large enough to win a prize. Strong, short-jointed cuttings taken from as near the base of the stems as possible are the best. These should be cut into the soft growth and shorn of a few leaves, which would, if left on, hang about the base of the cutting and encourage damping. Abundance of water must be given for the first week, for the cuttings should never be allowed to wilt. They will be rooted in about thirty days, and may be potted into small pots in light soil and kept in a cool house.

Wellesley, Mass. *T. D. H.*

Solanum capsicastrum.—For the Christmas season no better decorative plant can be had than this old-fashioned and beautiful little subshrub. The numerous globular fruits, which are about half an inch in diameter and of a bright scarlet color, contrast well with the dark olive-green foliage. The plants, to be effective, should be dwarf and bushy, about as wide across as they are high and with well-set fruit. To grow them successfully, an airy and partially shady position must be had in summer. The watering should receive careful attention, and under no circumstances must the plants be allowed to get dry. At the same time the drainage must be good. Pinching of the young shoots is necessary to form bushy specimens, but as soon as the flowers appear in summer care must be taken not to pinch off flowering shoots. The flowers, and consequently the fruits, are produced in little clusters nearly opposite the leaves. The stem is slender and branching, with alternate, more or less lanceolate, leaves, generally appearing two together, one being much larger than the other. Altogether, this makes a most cheerful fruiting plant for Christmas table decoration.

Lælia anceps.—This beautiful Orchid, so rich in variety of color, is one of the very best for the Christmas season. The firmness and lasting quality of its flowers, their moderate size and delicate texture make this one of the most valuable of winter-flowering plants. The color ranges widely from pure white in the rarer and more expensive varieties to flesh-color, rosy purple, pale purple, rose and lilac, with more or less deeply colored crimson-purple, deep purple or maroon in the lip. The plants succeed well in cool and airy positions during summer, their growing season. They do well on blocks of wood or in baskets, the former mode being preferable, as the plants take no nutriment except from air and water. Well-diluted manure-water once a week is excellent for this as well as for most Lælias and Cattleyas. The large growers nowadays use very little fibrous peat and moss, if any at all, as it is not essential; it is rather an obstacle to the free development of the numerous long and fleshy aërial roots.

Newark, N. J. *N. J. R.*

Correspondence.

Chrysanthemums.

To the Editor of GARDEN AND FOREST:

Sir,—Probably the majority of visitors to Chrysanthemum exhibitions in Boston would be as well pleased with smaller specimen plants than they have been accustomed to see, if they indicated equal cultural skill, but of late years the size of the plant has become such an important element in successful competition, that all growers for exhibition must make it a leading object.

Perhaps fashion in flowers has very much changed the Chrysanthemum during recent years, during even the last five. The Boston schedule five years ago called for all classes, and it was generally understood that there should be included representatives of all the types; and, as a matter of fact, the exhibitor who had the most diverse group, all things being equal, stood the best chance of winning. But size does not always go with this differentiation of the species, so that the neater Chinese, Anemone-flowered and Pompon varieties have been discarded in favor of the Japanese sorts.

I am disposed to think that we, the gardeners and florists, are making this fashion rather than the public; and that, if the Chrysanthemum is losing its popularity, as some say, we are to blame in a large measure. The criterion set up by the Chrysanthemum Society of America, of a stiff stem, with foliage up to the bloom, of decided colors, yellow, white, pink and crimson, without shadings, leaving out the purple and bronze colored varieties, forces raisers of new varieties who need their recognition, to discard many worthy kinds which would lend variety in color, so necessary in the proper blending of any color-scheme or combination. The demand of the professional florist for varieties of good shipping qualities has been another important consideration with the judges; and any loose-petaled varieties, no matter how attractive in form the flowers may be, seldom get more than "commendation." Very naturally, the florist will not grow these odd varieties, and discards them one after another as fast as it is discovered that they cannot be shipped to advantage. The retailer does not want them either, as he cannot handle them as profitably as he can the compact and mostly incurved flowers of the Japanese type, so common of late years. In looking over the catalogue of a leading firm in 1890, the only varieties of any standing among florists to-day are Minnie Wanamaker, W. H. Lincoln and Eda Prass, and these are holding their own for the simple reason that they can be shipped advantageously. The following comments I copy from Mr. A. H. Fewkes' report as chairman of the Flower Committee, in the *Transactions of the Massachusetts Horticultural Society for the Year 1894.* He says:

"The extremely large blooms are magnificent in their way, and show what can be done with the Chrysanthemum in skillful hands. We would not say one word against them, but in striving for immense size are we not losing many interesting forms which always attract attention when put on exhibition? It is true, these are not valuable commercially, but a Chrysanthemum show is not complete unless all the various forms are represented, and efforts should be made to grow as many forms as possible. Many curious varieties have come to this country from Japan which have been lost, simply because they were of no use as market flowers, or because they could not compete in the same class as the monster blooms. This should not be so, and we hope at no distant time we shall see more of the small but curious forms at our exhibitions."

In moving among private gardeners and amateurs we know that they would prefer to see more of the artistically and curiously formed flowers grown than we have, and when a dozen or more are arranged in a vase a variety of color and shading, when handled with proper skill, produces the best effect, and when it is possible to mix in a few smaller blooms with the larger ones a still better effect can be made. Among the varieties which florists every year discard may be found such as Spaulding's Heron's Plume, a lovely variety with shining strap-shaped petals of the purest white, and twisted like a ball of ribbon; Gloriana is a yellow variety of similar make; Iora, a finely built flower of tubular, twisted and interlaced petals, of a lovely lavender-pink, a color found in no other variety. In carrying a large plant of this variety over seventeen miles of road into the Boston exhibition we had to make a separate parcel of every bloom, snugly twisting it up in tissue-paper, or all the blooms would have so interlaced that they never could have been separated without destroying the beauty of the plant. There is Tuxedo, of brilliant orange-red, no other known variety equaling it in depth of color, but the flowers are undersized; that is enough to consign it to oblivion.

One of the most pleasing features of the last Boston show was a group of Japanese Anemone-flowered sorts, shown by Mr. Brydon, gardener to John Simpkins, Esq., of Yarmouthport. It is safe to say that these attracted more attention than the largest blooms exhibited. Dr. G. C. Weld (Kenneth Findlayson, gardener) also showed a striking lot, including Gaza, a beautiful white; Yellowhammer and Judge Hoit. Mr. Simpkins' group contained some immense blooms, Rider Haggard being especially noteworthy on account of size, but these large ones were not as beautiful as several smaller forms, among which may be mentioned George Hawkins, yellow; Ida Strickland, bronzy; Enterprise, light pink; Mrs. F. G. Dexter, crimson and yellow; Mrs. Robert Owens, white; San Joaquin, large pure white, and Satisfaction, chrome-yellow, with notched and twisted petals, an elegant flower. Mr. Howard, of Winter Hill, Somerville, had a neat lot of Pompons in one corner of the hall, and there never was a time when one could not see three or four elderly persons, usually ladies, admiring them and talking of bygone days in the old garden at home.

Wellesley, Mass. *T. D. Hatfield.*

Viburnum Lantana.

To the Editor of Garden and Forest:

Sir,—Viburnum Lantana well deserves the commendation which you give it. When in England, last summer, I saw quantities of it growing wild, and most beautiful it was. It was invariably growing on the top of chalk cliffs, as I found it where chalk was close to the surface. Near Brading, in the Isle of Wight, there are great elevations, like small mountains, called downs, which are composed almost wholly of chalk, and on the summit of these, sometimes with not six inches of soil above the chalk, this Viburnum grows in quantities and in most vigorous condition. It was in July when I saw them, and the bushes, which were from six to eight feet high, were loaded with fruit, which was just turning from green to red. In the hedgerows adjacent, and elsewhere in the island, were many bushes which had sprung up from seeds dropped by birds. About the same time of the year, at Henley-on-Thames, I saw the shrub in thickets, and here, too, chalk was abundant.

As I write, in the middle of December, there are small seedling plants in Germantown with their leaves still alive, though severe frosts have occurred; but small seedlings of many species retain their foliage later than larger plants do.

Germantown, Pa. *Joseph Meehan.*

Irrigation in New Jersey.

To the Editor of Garden and Forest:

Sir,—The note in Garden and Forest, December 11th, page 496, under Cultural Department, giving Mr. Hale's method for irrigation, leads me to send a few words concerning irrigation as carried out during the past season at the College Farm.

The water used is from the reservoir which supplies the city of New Brunswick. The field upon which the water was applied has a slight incline, and the water was carried to its upper side by means of underground pipes which end—three of them—in uprights provided with faucets and surface iron pipes. To the faucets inch garden-hose was attached, and the water thereby applied to the surface of the ground.

The piping was not in place until past midsummer, and was not employed until the dry spell of autumn.

A crop of Wax Beans was planted in August, and to a portion of the area thus occupied water was applied between the rows. Upon one one-hundred-and-twentieth of an acre 1,685 gallons were applied during a period of three weeks, from September 17th to October 5th, when the beans were harvested. The average yield of the non-irrigated belts, in good-sized pods, was seventeen pounds, while upon the irrigated land it was forty-five pounds, or nearly three times as many; besides, the pods were larger-sized and of finer color and quality.

To another area of the same size 1,830 gallons of water was applied to Peppers. The average yield upon the non-irrigated belts was 717 fruits, but upon the irrigated land it was 1,277. In weight the difference was greater, for the non-irrigated land gave 80 pounds, while where water was applied the weight was 147 pounds. The latter fruit was much better in color and quality, and would sell at the highest price.

A crop of Celery was grown after Beans, the plants being set August 6th. The rows were four feet apart, and each alternate row received water from September 17th until October 28th. The total weight of celery produced was 465½ pounds, 329½ pounds being in the irrigated rows and 136 pounds in the rows receiving no water. In round numbers, this is two and a half times as much celery upon the irrigated as the non-irrigated land. These figures do not indicate the full difference of market value. The largest yield for both the irrigated and non-irrigated belts was upon one of the two to which the Bordeaux mixture had been applied, and this was therefore selected to determine the relative amounts of refuse. After the plants were prepared for market, by removing worthless outside leaves and the roots, the weight of the irrigated plants was reduced from forty-two to thirty pounds, while that of the non-irrigated rows fell from 17 to 10½ pounds. In short, the difference in marketable products of the two rows is as three to one, but when the actual selling price is considered it is not far from eight to one in favor of irrigation.

The method of applying the water, the dates and amounts for each crop, the cash and other details of this irrigation experiment with garden crops will soon appear in a bulletin from the New Jersey Experiment Station.

New Brunswick, N. J. *Byron D. Halsted.*

Meetings of Societies.

Irrigation for Kansas Farms and Orchards.

THE twenty-ninth annual meeting of the Kansas State Horticultural Society was held at Lawrence, the centre of a large fruit-growing interest in the eastern part of the state and the seat of the Kansas University. The subject of greatest interest to a largely attended assembly was irrigation as applied to fruit-growing, with the allied subject of subsoiling. Perhaps the most interesting paper on the programme was by George M. Munger, of Eureka, Greenwood County, on Irrigation with Storm Waters. Mr. Munger owns the largest farm irrigated in this way in Kansas, if not in the United States. His orchard comprises over five hundred acres, principally Apple and Pear trees, besides two hundred acres of forest-trees and other land not in orchards. His reservoir now covers sixty acres, but is designed to cover eventually a hundred acres, the water in the deepest part being now seventeen feet. The dam which holds this water is made across the mouth of a broad, shallow valley, and is constructed entirely of earth. It is ten feet broad at the top, so that teams can be driven over it in making repairs. In building the dam the surface soil was first removed and the subsoil, which is a stiff clay, was used in its construction. It was put on in thin layers, say a foot in thickness, so that it was thoroughly tramped by the teams. The surface soil was used on the faces of the dam. Two drains, or ditches, filled with broken rock, were put in the bottom of the dam, running lengthwise of it, to carry off the seepage water. This Mr. Munger considers very important in preventing the dam from becoming soft and thus allowing the formation of leaks. The spill-way must not be through or over the dam, which must be built so high that the spill-way can be carried over the original surface, around one end of the dam. This is an important point, in Mr. Munger's opinion, when heavy rains come, especially when, as is apt to be the case, the water-shed drained is too large for the reservoir. The water from Mr. Munger's lake is pumped by a steam-engine and a centrifugal pump to a reservoir on the highest point of the farm, from which it is distributed by ditches. Situated, as the plant is, in the eastern third of the state, the experiment will be watched with interest by all who believe, as many now do, that in any part of our state, and, indeed, of most other states, there will be periods of drought in almost any season when it will pay to apply water to crops.

In speaking on orcharding in western Kansas, Mr. Longstreth, of Lakin, Kearney County, which is in the extreme western part of the state, brought out a point which is of interest in connection with Professor Waugh's article in a recent number of Garden and Forest on the "Western Apple Crop." Mr. Longstreth has an orchard of seventy acres, set in 1886, principally Apple-trees. Since the orchard came into bearing he has had but one failure, and that was from the effects of a late frost. During the past season, when apples were falling so badly all over the state, he has had no trouble whatever in that way. In fact, he never raised a larger crop of finer apples. He irrigates twice a year—once in February and once in July—flooding the land, and using about ten inches of water each time. He finds that watering heavily a few times gives better results than more frequent and less copious watering.

Professor Haworth, geologist at the Kansas University, gave an interesting account of some researches made last summer in regard to the underflow, so-called, in the western part of the state. He found that water-bearing strata underlie most of

the western third of the state at a depth varying from a few feet to a hundred or more, and the supply seems inexhaustible. Mr. Cowgill, editor of *The Kansas Farmer*, gave the results obtained on his farm in this region, which seem to confirm this opinion. He has in his well a six-inch cylinder pump. To this was attached a gasoline engine, which was run for five hours, pumping at the rate of 500 gallons a minute. This apparently having no effect, the speed was increased so as to throw 700 gallons a minute, and the pump was run for seven hours, when the water in the well was lowered just two inches.

Mr. Evans, President of the Missouri Valley Horticultural Society, described a cold-storage plant on the grounds of the Alden Fruit Company, in southern Missouri. The building is eleven feet high, twenty feet wide and a hundred and fifty feet long. There is a driveway through the middle, and the apples are stored on each side. The building is set north and south on the natural level of the ground, the sides being double and filled with sawdust, with earth banked up nearly to the top of the walls outside. They depend entirely on lowering the temperature of the house during cool nights. At each end of the building is an air-tight anteroom with doors opening both into the building and outside. There is also a heavy grating, which may be closed and the doors left open. Whenever the outside atmosphere is lower in temperature than that in the house the doors are opened, and if at night, as, of course, is usually the case, the grating is closed to keep out intruders. In this way the temperature of the house was gradually forced down to forty degrees, Fahrenheit, quite early in the fall, and the apples, stored as gathered, are now in as fine condition as they were when picked. In storing the apples the teams are driven into the air-tight anteroom before mentioned, and the outer door closed. The inner door is then opened and the team driven into the storeroom, thus preventing almost entirely draughts from the outside when they would raise the temperature of the house.

In a paper on some of Munson's Hybrid Grapes, Professor S. C. Mason characterized Brilliant, a cross between Lindley and Delaware, as one of the finest red grapes ever offered. It is more attractive in color and more sprightly in flavor than either of its parents. It is a free, vigorous grower, but at the experimental vineyard needs winter protection. Munson's hybrids, with the Post Oak Grape, Vitis Lincercumii, are entirely different from all the other classes at the station. They are late in blooming, coming into flower as other sorts go out, and frequently remaining in bloom till the middle of June. This is a valuable characteristic when late frosts are likely to occur. All these Post Oak hybrids have proved tender. This may not be due entirely to cold, however, but to some other cause or combination of causes. These hybrids are probably better suited to southern Kansas and Oklahoma than to the latitude of Manhattan. Carman is one of the best, being about the size of Ives, with handsome compact bunches and a fine purple bloom. It is of fair flavor, but has rather too many seeds for a first-class table grape.

State Agricultural College, Kansas. *F. C. Sears.*

Recent Publications.

The *Annual Report of the Director of the Experimental Farms of Canada for* 1894, an octavo volume of 422 pages, has just been issued, and proves to be a volume of unusual practical value and interest to the farmer and fruit-grower. Omitting all reference to the purely agricultural features of the report, it is found to be especially suggestive to the horticulturist and the forest-tree planter, Director Saunders himself being an enthusiastic tree-planter. He has planted forty-six trial hedges at the Central Farm at Ottawa for comparative study, including not only hedge-plants as ordinarily understood, but such trees as White Elm, Spruce, White Pine and Hackberry. Of these thirty were planted in 1889–91, among which the Siberian Pea-tree (Caragana arborescens), Russian Mulberry, White Spruce, Barberry, Golden-leaved Spiræa, Arbor-vitæ, Lilac, Viburnum (V. lantana), Buckthorn (Rhamnus frangula) and Colorado Blue Spruce are especially liked for one purpose or another. A list of flowering shrubs desirable for Canada, with description of each, is added. Of several varieties of Russian Poplars and Willows named, Populus certinensis is especially recommended, although it is noted as only half-hardy at Brandon and has failed utterly in the plantations of the South Dakota Experiment Station.

As a result of spraying experiments continued over a period of six years, during which thirty different mixtures were tested, Professor Craig, the horticulturist, recommends an application of solution of bluestone before the foliage appears, followed by Bordeaux mixture of a strength of four per cent. copper sulphate, four per cent. lime and fifty gallons water. If the disease is not overcome before the fruit begins to color, the ammoniacal solution of carbonate of copper, which is colorless, should be used as a last application. Detailed statements of experiments in commercial orchards are given and fully justify the recommended practice.

Regarding Russian Apples, many varieties of which have been planted at the Central Station, Professor Craig says, "With present experience, I can now say that I do not know of any winter Russian Apples which seem to me worthy of cultivation where Ontario and Northern Spy can be grown successfully."

In 1893 twenty-nine varieties of Russian Apples were planted at the Brandon, Manitoba, Station, and only ten of these survived the first winter, all the survivors being in a badly damaged condition. Anis Apples, planted in 1890, have only been able to survive on account of the snow-drifts which have covered them entirely every winter, and they are making no progress. Native Plums, taken from the Brandon Hills, and seedlings of Weaver, Cheney, Speer and De Soto, which were planted in 1890 to 1893, seem thus far promising, the natives having borne a good crop of fruit in 1894. Neither the standard or the Russian Cherries have succeeded at this station, but the wild Sand Cherry, Prunus pumila, is doing well.

Mr. Bedford's notes on the forest-trees growing at the Brandon Station form much the most interesting part of his report. In a shelter-belt ninety-five feet wide and 775 feet long, the trees were planted 4½ feet by 4½ feet in 1889. Blanks were reset in 1890 and 1891. From a tabulated statement it appears that the highest trees are Dakota Cottonwood and a Russian Poplar, P. Bereolensis, each sixteen feet. Among the best growths are Canoe Birch, twelve feet; Sweet Birch, Betula lenta, thirteen feet; Box-Elder, fourteen feet; Carolina Poplar, fifteen feet; Sharp-leaved Willow, Salix acutifolia, fifteen feet; Aspen, ten feet; several Russian Poplars, twelve to fifteen feet; Manitoba Larch, eight feet; native White Spruce, six feet; native Green Ash, nine feet. Among other hardy subjects reported are Bur Oak, Red and Black Ash, European Larch and native White Elm, while of smaller trees, the Manitoba Mountain Ash, Laurel-leaved Willow, Caragana arborescens and Artemisia Abrotanum are hardy.

Mr. A. Mackay, the Superintendent of the Experimental Farm at Indian Head, Northwest Territories, reports a general failure of orchard and small fruits, and in the report on forest-trees the list of promising kinds is limited. Box-Elder has been most extensively planted and is favored. Among other native species that are doing well are the Buffalo Berry, Choke Cherry, Wild Red Cherry and Saskatoon, Amelanchier alnifolia. Several of the Russian Poplars and Willows are considered good, and the Russian Artemisia is most highly recommended as a low wind-break for cultivated fields and gardens.

Notes.

The Oregon Experiment Station is making a horticultural survey of that state by sending out circulars of inquiry to every section, so as to ascertain all the facts which will be of interest to persons who wish to engage in fruit-culture or gardening of any kind. A similar survey has been made by the chemical department, in which the character of the soil is approximately described.

Professor Massey inquires why the dealers in Christmas greens do not send to the North Carolina coast country for branches of the beautiful Yaupon or Cassena, Ilex (Cassine) Vomitoria, whose berries are more abundant and brighter than those of our common Holly, and whose foliage, although not

as glossy as that of the English Holly, is smooth, rich green and very attractive.

A seedling Apple from north-western Arkansas, which attracted some attention at the World's Fair, is highly praised by the fruit-growers of that state. It is called the Senator, and Mr. Carman, of *The Rural New-Yorker*, to whom one of the fruits has been sent, describes it as a red apple on a greenish yellow ground and sprinkled with grayish dots. The flesh is yellowish white, stained with pink, of a sprightly and intense apple flavor, agreeably blending the acid and the sweet. It is said to be about a month later than the Jonathan apple—that is, it should be picked about the first of October in north-western Arkansas. A new apple of good size, good color and very good quality is worth trying in other sections of the country.

A recent number of *The Garden* contains an illustration of the fruit of Physalis Franchetti, a new Japanese Winter Cherry. P. Alkekengi is well known for its cherry-like fruit inclosed within the balloon-shaped calyx; the fruit of this new variety is similar in structure, as large as a duck's egg, and is said to be a charming shade of red or orange-vermilion. These inflated calyces, being translucent, have the appearance, when set in the light, of diminutive Japanese lanterns hanging among their own soft green leaves. The variety was introduced from Japan a year or so ago by Mr. J. Veitch, of Chelsea, London, and fruited luxuriantly this autumn on his trial grounds. Like the old-fashioned Winter Cherry, it has some value in cookery, but it is chiefly for ornament that it will be valued in our gardens and for autumnal and winter decoration.

Dr. D. Morris, Assistant Director of the Royal Gardens at Kew, sailed from this port on Thursday for the Bahama Islands, where he is to investigate the plantations of Sisal Hemp and other industries in the British West Indies. While in this city Dr. Morris delivered a lecture under the auspices of the New York Botanical Garden in the hall of the Museum of Natural History. This lecture was a sketch of the great botanical establishment with which he is connected, giving an account of its different departments, a description of its museums and galleries and a sketch of its general administration, and more particularly of the influence of Kew upon scientific botany and the development of horticultural industries in the colonies. The discourse was illustrated by excellent lantern views, and gave much pleasure and instruction to a large audience.

The Agricultural Gazette, of New South Wales, states that there is still living at Kenmore, in excellent health, Mr. Charles Ledger, the man who forty years ago, after most perilous adventures, introduced the variety of Cinchona Calisaya known as Ledgeriana into the island of Java, and not much afterward introduced a flock of alpacas and other animals from South America into Australia, which have been of priceless value to that country. Messrs. Howard & Sons, the great quinine firm, says that the supply of Peruvian bark from Java is almost all from the Ledgeriana trees, the only complaint against this variety being that it has turned out so rich that the trees are supplying too much quinine for the world to consume. Perhaps the quantity of bark which is now produced every year from seed furnished by Mr. Ledger cannot be short of ten million pounds, and to him, more than any one else, perhaps, is due the fact that quinine has been brought within the means of the very poorest.

The cabbage maggot, which is the larva of Anthomyia Brassicæ, is a destructive pest of the Cabbage in Europe, where it sometimes destroys entire fields of young plants. But, although it has been occasionally noticed in this country for the past fifty years, it has rarely appeared in such alarming numbers as it has during the present year on some of the truck-farms of North Carolina. If the maggots appear in the seed-bed a dressing of lime or muriate of potash should be given to the soil, or else enough of the kerosene emulsion to wet the ground one inch deep. If plants in the field are attacked a hole should be made near each plant with a sharp stick about an inch in diameter and as deep as the roots of the plant, and filled with the kerosene emulsion. If this does not moisten the soil on all sides of the plant a similar hole on the opposite side should be filled. The emulsion should be made of half a pound of hard soap, one gallon of water, and one gallon of kerosene oil, diluted with nine times its bulk of cold water before using. When properly made this emulsion does not hurt the plants, but if any of the free oil rises to the top it should not be allowed to touch the leaves.

Thomas Andrew Knight, of whom a brief account is given in another column, was among the first to realize that the garden Pea could be improved by cross-fertilization, and as long ago as 1787 he crossed the flowers of one of the common white peas then in cultivation with the pollen of a gray pea, and was so pleased with the results that a few years later he introduced Knight's Tall Green Marrow and Knight's Dwarf Green Marrow, perhaps the earliest examples of improved seedlings, which now are numbered by hundreds. This was the beginning of the advance toward the wrinkled section, the different varieties of which are now almost exclusively planted for home use. In a lecture on the garden Pea and its varieties by Mr. A. J. Deal, and reported in *The Journal of Horticulture*, it is said that in England the Ne Plus Ultra is looked upon as the best-flavored pea, although some of the sorts with dark green pods, like the Duke of Albany, Autocrat and Sutton's Late Queen, surpass it in this respect. The Pea most grown for the London market is Telegraph. Very probably the tall Peas, that is, those exceeding three or four feet high, will be banished, as well as the round-seeded kinds.

It seems to be settled that underground irrigation is practicable in western Kansas, where the water is pumped from the so-called underflow. Of course, the method is not practicable in open soil and a porous subsoil, for the water will not spread laterally in a soil lacking capillarity, nor will it rise to the surface, but will run away and be lost. But in a soil of fine texture, containing silt or clay mixed with fine sand, the water will spread in every direction, and when applied through tiles fifteen or twenty inches below the surface all the water is utilized. In the hot summer months much water is lost when applied in ditches; at least an inch of water will evaporate from freshly moistened soil in less than three days. When the water enters the ground below the surface no crust is formed and there is no need to cultivate after each application, for the surface keeps dry and acts as a mulch. Another advantage of this system is that pumping can be kept up all winter, and wind power can be used during the months when the most wind prevails. According to *The Kansas Farmer*, subirrigation has been tried, not only for vegetables, but to some extent for field crops and for orchards, although for the latter purpose it has failed in California, from the fact that the roots of the trees ultimately filled the tiles and stopped the waterflow. In Kansas tiles are laid closely in level ditches and cement is poured over the joints, leaving but a small aperture at the bottom, and it is hoped that the tree-roots can be kept out. Experience alone will tell. Certainly it seems that subirrigation would be a good method for the disposal of sewage in country places, and in this way help to get rid of the expensive and dangerous cesspool. The waste-pipe from the house could be connected with a system of tiling in the vegetable garden or elsewhere; water and fertilizing material could thus be put where they are needed and the cesspool could be done away with.

It is well known that Cannas were rarely planted except in botanical gardens twenty-five years ago, when Monsieur Année, of Passy, France, began to obtain crosses between the different species. After that time great advance was made until the race of large-flowered plants was obtained by Monsieur Crozy. In the last number of *The Gardeners' Chronicle* Mr. Edouard André speaks of still another race, which he calls Italian Cannas, produced by Messrs. Dammann & Co. at their grounds, near Naples. Monsieur Sprenger, a member of this firm, concluded that by constantly interbreeding the large-flowered varieties nothing novel or more remarkable could be secured, and he, therefore, has been experimenting with some new blood, employing for this purpose the Canna flaccida, a species of the southern United States, of medium height and large flowers, with one specially developed petal. His first success was a plant named Italia, from seed of Madame Crozy, fertilized with a fine variety of C. flaccida. The flower is of unusual size, of a golden vermilion color, and the peculiarity of it is that it is flattened so as to resemble a Kæmpfer's Iris or a Cattleya. Another variety, Austria, was produced the same year, bearing yellow flowers, shaded with purple. In 1894, Atalanta, America, Burgundia and Allemaniana, all plants distinct in foliage and flower, were selected from thousands of seedlings, and a dozen named varieties of new forms and colors have been produced this year. The illustration of a single flower of Italia shows that it is very interesting in form and about five and three-quarter inches across. American hybridizers have been producing some fine Cannas, and they will not be slow to avail themselves of this new departure and make experiments in the same direction.